

## SPECIFICATION

### TOOL FOR ATTACHING INTEGRATED CIRCUIT PACKAGE TO ELECTRICAL CONNECTOR

#### BACKGROUND OF THE INVENTION

##### 1. Field of the invention

**[0001]** The present invention relates to a tool receiving an electrical connector thereon for assisting in attaching an integrated circuit package such as a land grid array (LGA) central processing unit (CPU) onto the connector with zero insertion force, thereby electrically connecting the CPU with a circuit substrate such as a printed circuit board (PCB). This application relates to a contemporaneously filed application having the same title, the same applicant and the same assignee with the instant application.

##### 2. Description of the prior art

**[0002]** Referring to FIG. 5, a conventional electrical connector 9 is used for electrically connecting an integrated circuit package such as a land grid array (LGA) central processing unit (CPU) 8 with a circuit substrate such as a printed circuit board (PCB) (not shown). The connector 9 comprises a substantially rectangular insulative housing 91, and a plurality of electrical contacts 92 received in the housing 91. The housing 91 comprises a generally rectangular bottom wall 911, and four raised sidewalls 912 extending perpendicularly from a periphery of the bottom wall 911. A multiplicity of passageways 914 is defined in the bottom wall 911, the passageways 914 receiving a corresponding number of the contacts 92 therein. The sidewalls 912 define a generally rectangular cavity 913

therebetween, the cavity 913 receiving the CPU 8 therein. A spring arm 915 is formed in each of two adjacent sidewalls 912. A beveled block 9150 is formed at a free end of the spring arm 915, the block 9150 protruding into the cavity 913. A beveled surface 9151 is formed at an upper portion of the block 9150.

**[0003]** In attaching the CPU 8 onto the connector 9, the CPU 8 is firstly disposed on the beveled surfaces 9151 of the spring arms 915 of the housing 91. The CPU 8 is pressed downwardly, with two adjacent sidewalls of the CPU against the beveled surfaces 9151. The spring arms 915 elastically bend toward the corresponding sidewalls 912 of the connector 9, due to compression from the CPU 8. When a periphery of each of the blocks 9150 resiliently abuts against a corresponding sidewall of the CPU 8, a multiplicity of metal contact pads (not shown) of the CPU 8 electrically contacts the corresponding contacts 92 of the connector 9 respectively. The connector 9 electrically connects with the PCB, thereby electrically connecting the PCB with the CPU 8.

**[0004]** The CPU 8 is typically made of porcelain, and the housing 91 is typically made of insulative material such as plastic. During above-mentioned operation, the CPU 8 is liable to scrape the blocks 9150 of the connector 9. Some crumbs scraped from the blocks 9150 are liable to stick on a bottom of the CPU 8, and locate between the contact pads of the CPU 8 and the contacts 92 of the connector 9. This easily leads to disruption of the electrical connection between the CPU 8 and the PCB.

**[0005]** Additionally, when the spring arms 915 are relatively thin, portions of the spring arms 915 adjoining to the corresponding sidewalls 912 are liable to be broken during above-mentioned operation. When the spring arms 915 are relatively thick, the spring arms 915 is unlikely to be elastically bended due to less

elasticity. Thus, the CPU 8 cannot electrically contact the contacts 92 of the connector 9.

**[0006]** In view of the above, a tool receiving the connector 9 thereon to assist the connector 9 in overcoming the above-mentioned disadvantages is desired.

#### SUMMARY OF THE INVENTION

**[0007]** Accordingly, an object of the present invention is to provide a tool, which receives an electrical connector thereon for assisting in reliably readily attaching an integrated circuit package such as a land grid array (LGA) central processing unit (CPU) onto the connector with zero insertion force, thereby electrically connecting the CPU with a circuit substrate such as a printed circuit board (PCB).

**[0008]** To achieve the above-mentioned objects, a tool in accordance with a preferred embodiment of the present invention comprises a substantially rectangular base, and a pair of actuation members formed at two adjacent sides of the base. The base defines a substantially rectangular opening in a middle thereof, and a pair of chambers in the two adjacent sides thereof. The actuation members are disposed in the chambers of the base respectively. Each actuation member comprises a bridging portion spanning across the chamber and connecting with the base, a vertical driving portion perpendicularly crossing the bridging portion, a connecting portion connecting a junction of the bridging portion and driving portion with a bottom of the base, and an operating portion adjoining an outside of the driving portion. The operating portion comprises a beam extending perpendicularly from a bottom of the driving portion, and a push button formed at a free end of the beam and protruding out from the base. The push button is pushable to pivot an upper section of the driving portion.

**[0009]** Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**[0010]** FIG. 1 is an exploded, isometric view of a tool in accordance with the preferred embodiment of the present invention, together with a CPU and an exploded electrical connector.

**[0011]** FIG. 2 is an isometric view of the tool of FIG. 1, but showing the tool from another viewing aspect.

**[0012]** FIG. 3 is an enlarged, assembled view of the tool and the connector of FIG. 1.

**[0013]** FIG. 4 is an enlarged, cross-sectional view taken along IV-IV line of FIG. 3.

**[0014]** FIG. 5 is an exploded, isometric view of a conventional electrical connector, together with a CPU.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION**

**[0015]** Reference will now be made to the drawings to describe the present invention in detail.

**[0016]** Referring to FIG. 1, a tool 3 of the present invention is mounted on a bottom of an electrical connector 1 for assisting in attaching an integrated circuit package such as a land grid array (LGA) central processing unit (CPU) 2 to the connector 1 with zero insertion force. The connector 1 provides electrical connection between the CPU 2 and a circuit substrate such as a printed circuit board (PCB) (not shown).

**[0017]** The connector 1 comprises a substantially rectangular insulative housing 10, and a plurality of electrical contacts 12 receiving in the housing 10. The housing 10 comprises a generally rectangular bottom wall 114, and four raised sidewalls 111 extending perpendicularly from a periphery of the bottom wall 114. A multiplicity of passageways 1140 is defined in the bottom wall 114, the passageways 1140 receiving a corresponding number of the contacts 12 therein. A pair of protrusions 1150 depends from two diagonally opposite corners of the bottom wall 114 respectively. The sidewalls 111 define a generally rectangular cavity 115 therebetween, the cavity 115 receiving the CPU 2 therein. A spring arm 112 is formed in each of two adjacent sidewalls 111. Each spring arm 112 is relatively thick compared with an overall thickness of its sidewall 111, and forms a beveled block 1120 at a free end thereof. An engaging surface 1122 is defined on the free end of the spring arm 112 under the block 1120. The block 1120 protrudes into the cavity 115. An elongate slot 1141 is defined in the bottom wall 114 below each spring arm 112. Each contact 12 comprises an engaging portion securely received in a corresponding passageway 1140, a first contact portion protruding out from a top of the housing 10 for electrically contacting the CPU 2, and a second contact portion protruding out from a bottom of the housing 10 for electrically contacting the PCB.

**[0018]** Also referring to FIG. 2, the tool 3 is substantially rectangular, and larger than the housing 10 of the connector 1. The tool 3 comprises a substantially

rectangular insulative base 30, and a pair of actuation members 31 at two adjacent sides of the base 30 respectively. A generally rectangular opening 37 is defined in a middle of the base 30, for receiving the second contact portions of the contacts 12. A pair of holes 42 is defined in two diagonally opposite corners of the base 30, corresponding to the protrusions 1150 of the connector 1. A pair of clasps 43, 44 is formed at the two opposite sides of the base 30 respectively, and a projecting member 45 is formed at another side of the base 30 between said two opposite sides. A pair of chambers 36 is defined in the two adjacent sides of the base 30, corresponding to the blocks 1120 of the connector 1 respectively. A pair of recesses 38 is defined in the two opposite sides of the base 30, for facilitating detachment of the connector 1 from the tool 3.

**[0019]** The actuation members 31 are disposed in the chambers 36 of the base 30 respectively. Each actuation member 31 comprises a bridging portion 34 spanning across the chamber 36 and connecting with the base 30, a vertical driving portion 33 perpendicularly crossing the bridging portion 34, a connecting portion 35 connecting a junction of the bridging portion 34 and driving portion 33 with a bottom of the base 30, and an operating portion 32 adjoining an outside of the driving portion 33. The operating portion 32 comprises a beam 320 extending perpendicularly from a bottom of the driving portion 33, and a push button 321 formed at a free end of the beam 320 and protruding out from the base 30.

**[0020]** Referring to FIG. 3, in assembly of the connector 1 and the tool 3, the connector 1 is disposed over the tool 3, with the protrusions 1150 of the connector 1 above the corresponding holes 42 of the tool 3, and three of the sidewalls 111 of the connector 1 respectively contacting the projecting member 45 and the clasps 43, 44. The connector 1 is pressed down, and the protrusions 1150 of the connector 1 are received in the corresponding holes 42. The projecting member 45 of the tool 3 interferentially engages with a corresponding sidewall 111 of the connector 1. The

clasps 44, 45 engage against corresponding sidewalls 111 of the connector 1. Upper sections of the driving portions 33 of the tool 3 pass through the slots 1141 of the connector 1 and loosely abut the engaging surfaces 1122 of the spring arms 112.

**[0021]** Also referring to FIG. 4, in attaching the CPU 2 onto the connector 1, the push buttons 321 of the actuation members 31 are pushed toward the corresponding chambers 36 of the base 30. The beams 320 push the bottoms of the corresponding driving portions 33. The driving portions 33 pivot about the junctions of the bridging portions 34 and connecting portions 35. The upper sections of the driving portions 33 push the engaging surfaces 1122 so that the spring arms 112 elastically bend toward the corresponding sidewalls 111 of the connector 1. The blocks 1120 of the spring arms 112 withdraw toward the sidewalls 111, even though the spring arms 112 are relatively thick. Moreover, the thick spring arms 112 inherently resist breakage. The CPU 2 is then placed into the cavity 115 of the connector 1 with zero insertion force. That is, the CPU 2 does not scrape the blocks 1120. The actuation members 31 are then released, and the spring arms 112 elastically rebound to their original positions to press against adjacent outside walls of the CPU 2. Thus, the CPU 2 is safely retained in the connector 1.

**[0022]** Then the combined connector 1 and CPU 2 is detached from the tool 3, and the connector 1 is electrically connected with the PCB. The connector 1 can thus provide reliable electrical connection between the CPU 2 and the PCB. Alternately, if sufficient space is provided on the printed circuit board on which the connector 1 is mounted, the actuation member 31 may be directly associated with or attached to the insulative housing 10 of the connector 1 around the spring arm 112 rather than the external tool 3, thus the external tool 3 no longer being used. Such an alternation may be of a lever arrangement like the current embodiment of

the actuation member 31 or a cantilever arrangement like the upper handle of the spring latch used in the SIMM (Single In-line Memory Module) connector, e.g., U.S. Pat. No. 5,267,872. Anyhow, either the external actuation member of an auxiliary tool used for the connector or the self-equipped actuation member integrally formed with the connector, is designedly used to outwardly deflect the corresponding spring arm 112 for installation of the CPU into the housing 10.

**[0023]** While a preferred embodiment in accordance with the present invention has been shown and described, equivalent modifications and changes known to persons skilled in the art according to the spirit of the present invention are considered within the scope of the present invention as defined in the appended claims.